



ASSESSMENT and  
QUALIFICATIONS  
ALLIANCE

# Mark scheme January 2002

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## GCE

### Biology B

### Unit BYB2

**Question 1**

- (a) (i) Metaphase; 1
- (ii) Centromeres divide;  
Chromatids separate / pulled apart;  
By spindle fibres; 2 max
- (iii) Three chromosomes;  
One of each homologous pair; 2
- (b) 7.6 is replicated DNA / chromatids joined together / late  
interphase / prophase / metaphase / before cell division;  
3.8 contains single chromatids / DNA is not replicated /  
telophase / early interphase; 2
- Total 7
- 

**Question 2**

- (a) Phosphate; 2  
Sugar / deoxyribose / pentose;
- (b) 

	4	5	
4	6	2	

 2
- (c) Different genes are expressed in each; 2  
Producing different enzymes / proteins;
- Total 6
- 

**Question 3**

- (a) Male gametes are motile / flagellum / tail;  
Male gametes contain less cytoplasm / yolk / nutrients / food;  
Male gametes contain an acrosome;  
Some male gametes carry a Y chromosome;  
More male gametes released per ejaculate; 2 max
- (b) (i) Contain more cytoplasm / yolk / food / nutrients; 1
- (ii) Each is less likely to survive / less protection from parents (so  
more produced) / greater chance of fertilisation; 1
- Total 4
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**Question 4**

- (a) A gene (may) have more than one type of allele;  
Different chromosomes in a homologous / pair have different alleles;  
Homologous / pairs of chromosomes separate in meiosis;  
One chromosome from each pair goes to each daughter cell; 3 max
- (b) 7, 7;  
14; 2
- Total 5
- 

**Question 5**

- (a) (i) Cells do not secrete chloride ions / lower water potential in cell;  
Water is retained in cells / exit from mucus;  
Sticky / thick mucus (collects in airways);  
Coughing caused by irritation / inflammation; 3 max
- (ii) mucus blocks pancreatic duct preventing release of digestive  
enzymes / thick mucus layer reduces absorption of digested food; 1
- (b) (i) DNA strands separate / unzipped / hydrogen bonds break in the  
region of the gene;  
Nucleotides / bases line up according to base pairing rules /  
complementary / examples given / transcription;  
Role of RNA polymerase; 3
- (ii) 4437; 1
- Total 8
- 

**Question 6**

- (a) Asexual / vegetative propagation / cloning; 1
- (b) (i) Genetically identical;  
By mitosis; 2
- (ii) Environment affects plants in different ways / mutations; 1
- (c) Many plants produced in short period of time / seeds take longer  
to produce new plants / quicker;  
Desirable features are conserved; 2
- Total 6
-

**Question 7**

- (a) (i) Codon; 1
- (ii) Tyrosine; 1
- (b) (i) Base sequence / codon (of DNA) is changed;  
Different (sequence of bases in) mRNA;  
Attracts different tRNA / anticodon;  
Different amino acid inserted into protein / polypeptide; 3 max
- (ii) More than one base triplet / codon codes for one type of amino acid;  
Suitable example / true for the third base of the codon; 2
- (c) Endonuclease / restriction enzyme cuts DNA;  
Reference to specificity sticky ends / use the same restriction  
enzyme on fragment and plasmid;  
Ligase used to fix ends; 3
- (d) Details of taking a replica:  
ef filter paper / felt / nylon membrane;  
To obtain an exact copy;  
Bacteria spread on agar to obtain separate colonies;  
Grown on agar containing ampicillin;  
Bacteria containing plasmid survive;
- For principles and detail of replica plating:  
Placed on agar containing tetracycline;  
Bacteria growing on ampicillin, but not tetracycline contain  
the recombinant plasmids;  
Because foreign DNA has been inserted into the tetracycline gene;  
5 max
- Total 15
-

**Question 8**

(a)	DNA strands separate / hydrogen bonds broken; Parent strand acts as a template / copied / semi-conservative replication; Nucleotides line up by complementary base pairing; Role of DNA polymerase;	4
(b)	(i) Production of single / separate stranded DNA;	1
	(ii) Attaches to / complementary to start of the gene / end of fragment; Replication of base sequence from here;	2
	(iii) Enzymes active / not denatured at high temperatures; Allowing rapid replication of DNA;	2
(c)	256;	1
(d)	(i) Large scale / cheap / easier production of human protein;	1
	(ii) Long term effects unknown / effects of introducing foreign genes not fully known; Ethical issue explained - eg wastage of sheep embryos / embryos have potential for development / animal rights, eg wrong to experiment on animals; May encourage similar research using cells from human embryos / that develop into humans; May spread antibiotic resistance into other species; ( <i>Playing God / references to evolutionary effect – neutral</i> )	3 max
	Total	14